Volunteer Monitoring Report
Summary for Fifth Plain Creek in the Lacamas Creek Watershed
Clark County Washington

Introduction

This document provides a summary of volunteer monitoring activities on Fifth Plain Creek in the Lacamas Creek watershed. Monitoring took place over an approximate two-year period and was done entirely by volunteers with supervision by the Clark County Water Resource's program staff. The station became inactive after the fall monitoring in October 2004. This summary is intended to provide volunteers and the public with a summary of the results of the Fifth Plain Creek monitoring.

Results of Monitoring Fifth Plain Creek

Watershed Condition

Fifth Plain Creek drains the Upper Fifth Plain Creek subwatershed, which is part of the Lacamas Creek watershed in Clark County, Washington (Figure 1). This subwatershed is part of a group of watersheds in Clark County that include small streams coursing through a moderately steep landscape, overlying mostly gravelly and rocky ground. Local creeks with similar characteristics include Gibbons, Shanghai, Lockwood, and Brezee Creeks. Table 1 below summarizes the primary natural characteristics of the basin.

Table 1. Primary natural subwatershed characteristics for Fifth Plain Creek.

Characteristic	***Value***	***Characteristic***	***Value***
Drainage Area	4.6 square miles	Topography	Average watershed surface slope of 9.5%, moderately steep terrain
Stream Size	A small head-water stream	Average Elevation	750 ft
Soils/Geology	Predominantly poorly drained soils over gravels and some bedrock; mostly gravel sized (marble to tennis ball) substrate.	Average Precipitation	56 inches annually

The level of watershed development also has an important effect on stream characteristics and quality. Rural development typically includes the conversion of forest cover to agricultural or residential uses and the construction of road networks. Table 2 summarizes the primary development intensity characteristics of the Fifth Plain Creek watershed.

Overall, the watershed is developed primarily for rural residential and agricultural uses. Much of the forest cover has been cleared. Road density and percentage of total impervious area (TIA) indicate a higher level of urban development along with potential impacts from agriculture operations. TIA refers to the amount of land covered by non-absorbing surfaces such as roads, parking lots, houses, and compacted soil.

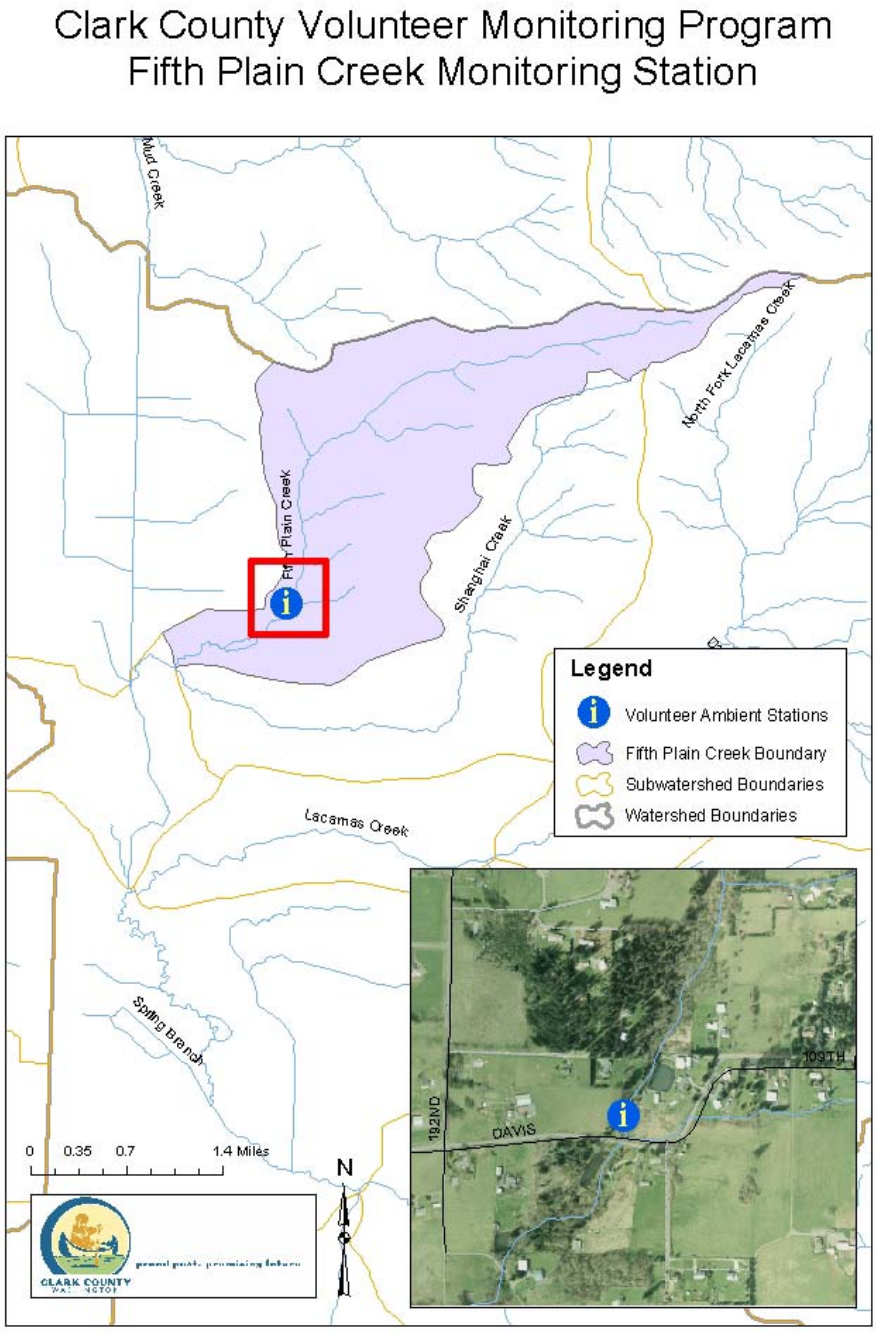

Figure 1. Map of the Fifth Plain Creek subwatershed and detail map of the monitoring station.

Table 2. Subwatershed characteristics of land development intensity for Fifth Plain Creek.

Characteristic	Value	Desired Condition for Stream Health
Road Density	~7 miles per square mile	< 3 miles per square mile (NOAA Fisheries 2003)
Total Impervious Area (TIA)	~15% impervious surfaces	<15% (NOAA Fisheries 2003)
Median Parcel Size	4.7 acres	No threshold but <5 acres storm water planning is recommended; county median subwatershed parcel size is about 3.5 acres.
Population Density	322 people per square mile	No threshold; county median subwatershed population density is 220 people per square mile
Land Use	Primarily zoned rural residential and agriculture <1% land publicly owned	No threshold; land use indicates storm water runoff rates and potential pollution sources No threshold; public land provides opportunity for restoration.
Land Cover	~45% forest cover, fragmented mix of conifer and non-conifer trees; ~30% natural grassy areas and crops;	> 50% (NOAA Fisheries 2003) No threshold.

Monitoring Activity Summary

The Fifth Plain Creek site was monitored by the Sculpin team from October 2002 to October 2004. Volunteers visited the site nine times in that period. Each time water samples were collected and submitted to a local laboratory. Three macroinvertebrate samples for biological assessment were collected over the same period. In addition, volunteers performed two habitat surveys and placed water temperature dataloggers in the creek to collect continuous temperature data throughout the summer in 2003 and 2004.

Water Quality Results

Clark County staff use a water quality index that was developed by the Oregon Department of Environmental Quality for communicating and tracking volunteer collected data (http://www.deq.state.or.us/lab/wqm/wqimain.htm). The Oregon Water Quality Index (OWQI) analyzes a defined set of water quality parameters and produces a score describing general water quality. OWQI scores range from 10 (worst case) to 100 (ideal water quality).

A water quality index is a single number which expresses water quality by integrating multiple measurements of water quality parameters. This index provides a simple, concise, and valid method for expressing the significance of regularly collected data, and was designed to aid in the assessment of water quality for general recreational uses.

As with most methods for generalizing water quality data, there are limitations to the interpretation of the data. The index cannot determine the quality of water for all uses. Some uses conflict with others. For instance, water quality considerations for agricultural uses are different

from considerations for recreational uses. The index cannot provide complete information on water quality. An index provides only a summary of the data.

The OWQI can be used to show water quality variation both spatially and temporally. The index allows users to easily interpret data and relate overall water quality variation to variations in specific categories of impairment. The OWQI can identify water quality trends and problem areas. These can be screened out and evaluated in greater detail by direct observation of pertinent data, thus increasing efficiency. Used in this manner, the OWQI provides a basis to evaluate effectiveness of water quality improvement programs and assist in establishing priorities for management purposes.

The figures below summarize the water quality index scores for the individual parameters, as well as for the monthly values during the entire monitoring period. A couple general patterns emerge from the Fifth Plain Creek dataset (Figures 2 and 3). Water quality index scores were typically lower during the summer relative to other times of the year. Nitrate, dissolved oxygen, and water temperature were all parameters of concern during the summer. Nitrate level is also a concern during the winter, with scores approaching the poor category. Fecal coliform was occasionally high in the raw dataset but did not appear to be a chronic problem reflected in the index scores. It is important to note that many water quality problems, such as high fecal coliform levels, get worse during storms and that this project did not target storms for monitoring.

The overall score shown in Figure 3 put the site in the 'Fair Condition' category, a few points from the good category.

An assessment of water temperature is possible using the continuous datasets from 2003 and 2004. Volunteers installed water temperature data loggers that recorded hourly temperature readings during the warmest period of the year, typically from May to October. A Washington State stream temperature criterion sets a maximum temperature of 64^{o}F to protect sensitive aquatic life like salmon and trout. Water temperature under the current state criterion is measured by the 7-day average of the daily maximum temperature (7-DADMax). The 7-DADMax is the average of daily maximums based on a moving seven-day window. So, for any given seven days there is one averaged maximum temperature. Scientists can use this to determine how often water temperature exceeded the standard, and get an average for the month or season.

The 7-DADMax water temperature for the summer season was 73ºF and 78ºF in 2003 and 2004, respectively. During both years the water temperature in the stream exceeded the state standard for over 80 days, nearly three months. During both years water flow was very low in the summer, which contributes to high water temperature and low dissolved oxygen levels.

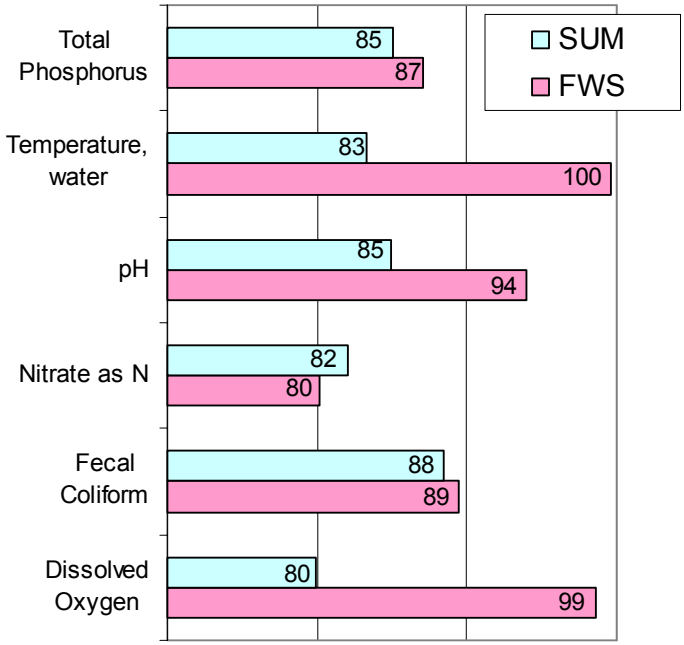

Figure 3. Average water quality index scores by parameter for Fifth Plain Creek from Oct 2002-Oct 2004. FWS and SUM represent the 'Fall/Winter/Spring' and 'Summer' monitoring periods, respectively; the Oregon WQI scoring system is as follows: < 60 = Very Poor Condition; 60-79 = Poor Condition; 80-84 = Fair Condition; 85-90 = Good Condition; > 90 = Excellent Condition.

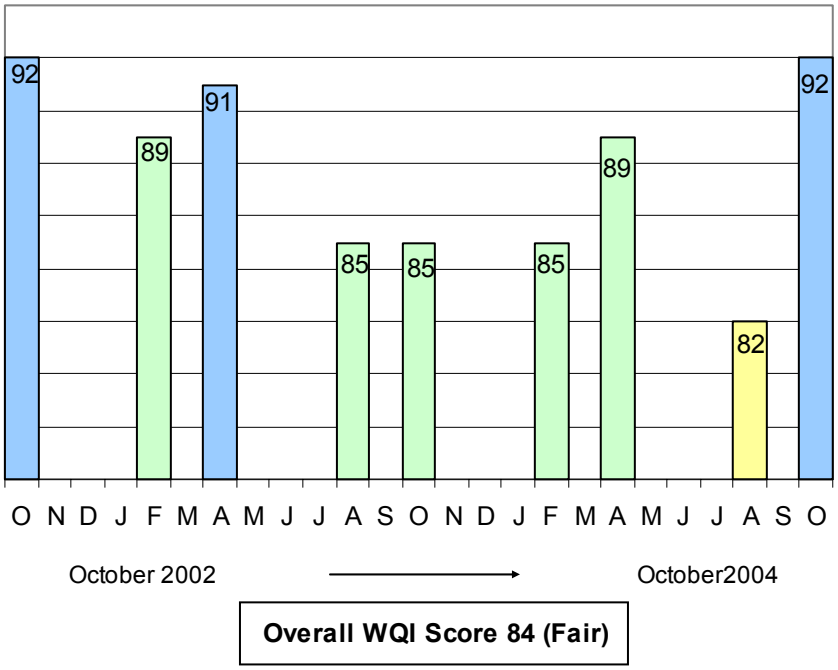

Figure 4. Monthly water quality index scores based on parameters shown in Figure 1; the Oregon WQI Scoring system is as follows: < 60 = Very Poor Condition; 60-79 = Poor Condition; 80-84 = Fair Condition; 85-90 = Good Condition; > 90 = Excellent Condition.

Biological Health as Indicated by Macroinvertebrates

Aquatic macroinvertebrates are good indicators of water quality and mirror changes in water quality with changes in their populations. Scientists have studied aquatic bugs for several decades and have developed indices to characterize stream health based on resident bug populations. An assessment of the bug population in any stream will give an indication of the health of that stream. In addition, they are an important part of the food web and their decline indicates a potential decline of other species.

The Benthic-invertebrate Index of Biological Integrity (BIBI) developed for Pacific Northwest streams was used to assess stream health from bug samples collected by volunteers. Figure 5 shows the overall BIBI score from 2002 to 2004. Bug scores were typically low for the creek, dropping from the fair category to the poor category from 2002 to 2003. The very low score in 2004 and the apparent downward trend in the bug scores are troubling. The stream's biological communities may be severely impacted by the very low stream flow and warm water temperatures observed in 2003 and 2004. Measurements of community diversity show a low number of pollution (heat and sediment) sensitive species and an increasing number of pollution tolerant species.

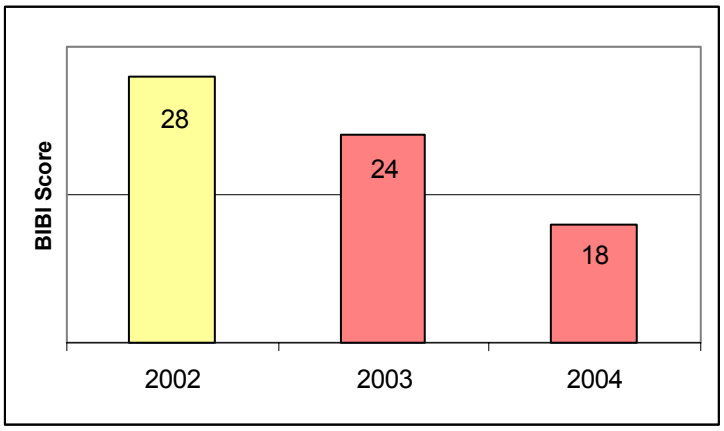

Figure 5. Pacific Northwest BIBI scores for Fifth Plain Creek. Yellow bars indicate 'Fair' stream health and red bars indicate 'Poor' stream health.

Habitat Measures

Volunteers performed two habitat surveys during the summers of 2003 and 2004 at the Fifth Plain Creek site. Their findings are summarized below:

- In general, volunteers were concerned about very low water levels and the subsequent effect on habitat in the creek;
- Reed Canary Grass and Himalayan Blackberry were non-native plants that were observed to be abundant along the creek;
- Gradient was measured to be slightly less than 1%, indicating a very shallow slope to the stream's surface;
- Substrate measurements in the form of pebble counts indicated that coarse gravel (marble to tennis ball sized) was the dominant substrate, followed by some cobble (tennis ball to basketball sized). Fine sediment accounted for between 5-10% of the substrate measured;

some filling-in with fine sediment was observed in the gravels, an indication of erosion upstream;
- 80-90% of the stream surface was covered with tree and brush canopy according to readings in the summer; the majority of the canopy cover was from deciduous trees;
- In the 165-foot reach three pools were identified which provide cover for aquatic life;
- One area of erosion was reported in the 2004 survey, which was actually a collapsed undercut bank that was reported as good habitat in 2003.

Overall, the habitat measurements indicate a fair to good setting for aquatic life in Fifth Plain Creek. The presence of non-native plants and slightly impaired canopy cover indicate room for improvement, especially in light of high water temperatures observed during the summer. Sedimentation of high quality substrate could limit aquatic macroinvertebrate diversity. Low water levels also limit the availability of habitat to stream organisms.

Management Issues

Currently, Fifth Plain Creek is on the WA State Department of Ecology's list of waterways requiring water quality cleanup plans. Data generated by Clark County from 1991-1992 resulted in a listing for high water temperature and pH levels, and low dissolved oxygen levels. Data submitted to Ecology from Clark County's Volunteer Program may be used confirm long term water quality problems and increase priority for completing the water cleanup plan. Aside from the formal listing, the creek's water quality in terms of water temperature and dissolved oxygen continue to exceed state water quality standards. The majority of water quality limitations may be related to very low summer flows.

The occurrence of occasionally high fecal coliform levels could be investigated. Potential sources in the basin include road runoff during storms, direct stream-access for stock watering, non-point source runoff from pastures, and contamination from poorly maintained septic systems.

Management of the creek should include considerations for the identified water quality problems and low stream flows. Furthermore, as a tributary to Lacamas Lake, water quality in the creek should be supportive of overall management goals for the lake.

Future Monitoring

Future monitoring efforts in the creek could include another brief period of monitoring in a few years to track the trends in water quality and biological variables, perhaps during a year with higher than normal precipitation. Particular interest in the management of Lacamas Lake could also initiate monitoring of relevant factors including phosphorus and creek flow.